APPENDIX A

APPENDIX A

FIELD PPROCEDURES

REMEDIAL EXCAVATIONS

Various remedial excavations were completed at the site between March 15 and May 22, 2008. These excavations were conducted by Bones Construction Company of Aloha, Oregon. Bones utilized two track-mounted hoes (John Deere 9920 LC and a CAT 315) equipped with various buckets (widths ranging between 2 (with teeth) and 4 feet). These excavations were conducted to maximum depths of up to 22 feet BGS, and confirmation soil samples were subsequently collected. Confirmation soil samples were either collected by hand (using new disposable Nitrile gloves), new Shelby Tubes (driven into undisturbed soil), or the excavator bucket. Depending on the depth and nature of analysis, a combination of these methods was occasionally utilized in collecting confirmation soil samples.

SOIL SAMPLING FROM EXCAVATIONS

Field representatives of GeoDesign, Inc. observed all remedial excavation activities at the project site. Representative samples were obtained from these excavations for laboratory testing. As requested by Ecology, soil samples collected for submittal of VOC analysis were not collected from the excavator bucket as this sampling method would have compromised the quality of the sample. The soil samples collected for submittal of VOC analysis were either obtained directly from remedial excavations by hand (if the excavation was less than 4 feet BGS), by utilizing an extendable-pole sampling apparatus (for excavations deeper than 4 feet BGS), or as a sub-core (sub-sample) of an undisturbed soil core obtained from the excavation with a Shelby Tube sampler connected to a trackhoe bucket. The samples obtained directly from the excavations or from the center of the Shelby Tubes, were collected by Method 5035 using a hand-held plunger set to collect the appropriate volume of soil for subsequent VOC analysis.

Each confirmation soil sample was immediately placed in laboratory-supplied containers (glass jars with Teflon-lined lids, unpreserved VOA vials, VOA vials preserved with methanol and/or VOA vials preserved with sodium bisulfate). The jars were packed full to lessen headspace in the containers. GeoDesign representatives wore new Nitrile gloves during sample collection procedures. The soil samples were immediately placed in a cooler with ice and kept cool during transport to the analytical laboratory. Chain-of-custody procedures were followed during handling and transport of the samples. A portion of the selected samples were used for field screening prior to sample collection.

SOIL SAMPLING FROM STOCKPILES

Field representatives of GeoDesign, Inc. segregated between 3,000 and 4,000 cubic yards of clean soil for reuse as backfill material at the project site. In addition, soil excavated during the cleanup actions were temporarily stockpiled and sampled prior to disposal. Soil generated during septic piping removal (above the piping) was also used on site as backfill material. The samples collected from the stockpiles were analyzed for the same analytical parameters as the confirmation soil samples collected from the limits of the excavation which generated the stockpiled soil. Soil samples were collected from the stockpiles according to the following frequency:

Bulk Cubic Yards of Soil	Minimum Number of Samples
0-30	1
31-100	3
101-500	5
501-1,000	7
1,001-2,000	10
>2,000	10 + 1 for each additional 500 cubic yards

Soil samples obtained from this material were collected after hand-digging at least 1 foot into the stockpile. For the submittal of VOC analysis, soil samples were collected by Method 5035 using a hand-held plunger set to collect the appropriate volume of soil for subsequent VOC analysis. Each stockpiled soil sample was immediately placed in laboratory-supplied containers (glass jars with Teflon-lined lids, unpreserved VOA vials, VOA vials preserved with methanol and/or VOA vials preserved with sodium bisulfate). The jars were packed full to lessen headspace in the containers. GeoDesign representatives wore new Nitrile gloves during sample collection procedures. The soil samples were immediately placed in a cooler with ice and kept cool during transport to the analytical laboratory. Chain-of-custody procedures were followed during handling and transport of the samples. A portion of the selected samples were used for field screening prior to sample collection.

SOIL SAMPLE FIELD SCREENING METHODS

The GeoDesign field representatives performed field screening tests on portions of the soil samples obtained from the confirmation soil sample locations. Field screening results are used to identify possible contamination in soil samples and to aid in selection of soil samples for chemical analysis. The field screening methods used included visual examination, water sheen testing, and headspace vapor screening (using a hand-held Mini Rae-2000 PID).

Visual screening typically involves inspecting the soil sample for visual indications of petroleum contamination, such as staining. Visual screening is typically more effective when soil samples are heavily contaminated, which generally results in staining.

Headspace vapor screening consists of placing a soil sample in a plastic bag and capturing air in the bag. The bag is then sealed and shaken to expose the atmosphere in the bag to VOCs in the soil. The PID intake probe is then inserted into the bag to measure the concentration of VOCs in the bag headspace.

Water sheen screening involves placing a portion of the soil sample in a pan of water and observing the water surface for visible sheen. Our sheen classifications are as follows:

No Sheen (NS)	No visible sheen apparent on the water surface.
Slight Sheen (SS)	Light, colorless, and dull sheen. Sheen typically dissipates rapidly and spread across the water surface is slow. Organic material in the soil can produce a slight sheen.

Moderate Sheen (MS)	Sheen may have some iridescence and color. Sheen spread across the water surface is fairly rapid and covers nearly the entire water surface.
Heavy Sheen (HS)	Sheen has color and is iridescent. Sheen spread across the water surface is rapid and the entire water surface is typically covered with sheen.

GROUNDWATER ELEVATIONS

Depths to groundwater relative to the monitoring well casing rims were measured using an electronic water-level indicator. The electronic water-level indicator was decontaminated with Alconox solution wash and a distilled water rinse prior to use in each well. Groundwater elevations were calculated by subtracting the water table depth from the surveyed casing rim elevations.

GROUNDWATER SAMPLING

Groundwater samples were collected from all three of the monitoring wells on May 12, 2008. Each groundwater sample was collected using a submersible bladder pump with disposable tubing. The sampling followed standard protocol for low-flow purging and sampling (EPA 1996). Non-disposable sampling equipment, including the submersible bladder pump, was decontaminated before each sample was collected. Purging continued until the following parameters stabilized as indicated:

- pH +/- 0.1 unit
- temperature +/- 1 degree Celsius
- specific conductance +/- 3 percent ohm-cm
- dissolved oxygen +/- 10 percent mg/L
- ORP +/- 10 mV
- Turbidity +/- 10 percent NTUs

Each groundwater sample was transferred in the field to laboratory-prepared sample containers (unpreserved glass bottles with Teflon-lined lids, glass bottles with Teflon-lined lids preserved with hydrochloric acid, VOA vials preserved with hydrochloric acid, and polyurethane bottles preserved with nitric acid). For the submittal of dissolved metals analysis, groundwater samples were field filtered with a disposable 0.45 micron high capacity filter. The sample containers were filled completely to eliminate headspace in the container, immediately placed in a cooler with ice, and kept cool during transport to the analytical laboratory. Chain-of-custody procedures were observed during transport of the groundwater samples to the testing laboratory.

DOCUMENTATION OF SAMPLE LOCATIONS

Field representatives of GeoDesign, Inc. utilized GPS (Trimble GeoXT or Garmin GPS-Map 60CSx) to document the locations of all soil samples collected. Estimated accuracy of GPS locations varied between approximately 1 to 15 feet. Therefore, when samples were collected within a few feet of each other, only one location was recorded using GPS. Sampling depths were documented in feet BGS.

CLEANUP ACTION-DERIVED WASTE

Purge-water generated during this investigation was contained in a WSDOT-approved, 55-gallon, steel drum. Various drums containing soil cuttings, decontamination water, and well development/well purge water were temporarily stored on the project site, pending disposal at an approved facility. GeoDesign is currently coordinating the removal of these drums.

BACKFILLING ACTIVITIES

Field representatives of GeoDesign, Inc. observed the backfilling of all excavations conducted at the project site.

Bones Construction utilized a bulldozer (CAT D-6) to place the backfill material in approximate 1-foot lifts. While placing the backfill material, bones cut shallow benches into the sidewalls of the excavation to allow for more uniform compaction along the edges. A sheep's foot compactor was then used to compact each lift. GeoDesign personnel conducted density tests with a Troxler 3430 nuclear density gauge in 2-foot increments. Test densities were compared to maximum densities determined in our soils lab in general accordance with ASTM D1557 (D698)/AASHTO (T-180 (T-99). However, a field proctor was established due to the variability of some of the backfill material used. In general, tested densities were above the required 95 percent of maximum density. In addition to conducting density tests, Bones utilized a dump truck loaded with backfill material to conduct proofrolls upon the upper 4-feet of the fill placement area. Minor deflection was present under the weight of the truck and pumping or cracking was negligible during the proofroll.

Excavations associated with dry well decommissioning activities were too deep for compaction equipment to be utilized, so a 'Hoe Pack' was used to compact backfill material in approximate 2-foot lifts.